PIPE COUPLINGS

Background of the Invention

This invention relates to pipe couplings and assemblies.

Connection to a corrugated pipe or conduit can be made by means of a coupling in which the end of the pipe is inserted, the coupling having a retaining member in the form of a resilient tooth that engages between corrugations to prevent the pipe and coupling being pulled apart after assembly. The coupling may have a tapering bore forming a close fit with the outside of the pipe so as to seal the pipe with the coupling. Couplings of this kind are described, for example, in US5094482, US5041256, GB2225550, US5150930 and US4923227 and are sold by Adaptaflex Limited of Coleshill, Birmingham, UK. Although the seal provided by these couplings is satisfactory in many situations, there are some applications where a more effective seal is needed.

Brief Summary of the Invention

It is an object of the present invention to provide an alternative pipe coupling and assembly.

According to one aspect of the present invention there is provided a coupling for a pipe, the coupling including a housing and retaining means for retaining the pipe within the housing, the housing having a bore therein, the coupling being of a relatively rigid plastics material and having a layer of a relatively deformable material moulded onto at least a part of both its inner and outer surfaces.

The layer on the inner surface is preferably adapted to form a seal with the outside of the pipe and may provide a tapering surface. The retaining means is preferably formed integrally with the housing and may include at least one resilient catch member adapted to engage a projection on the pipe. The pipe may have a corrugated external surface, the catch member being adapted to engage between the corrugations. The layer on the outer surface may include a part formed on an external ledge of the housing to provide a seal with a cooperating member and, or alternatively, it may include a part that provides a manual gripping region. The layer on the inner and outer surfaces is preferably continuous with one another. The deformable material may be an elastomeric material.

According to another aspect of the present invention there is provided an assembly of a corrugated pipe and a coupling according to the above one aspect of the invention.

According to a further aspect of the present invention there is provided a method of forming a coupling including the steps of injecting a first material of a relatively hard plastics material to form a housing of the coupling with integral retaining means and subsequently injecting a second, softer material to form a layer on the harder material both on the inside and outside of the housing.

According to a fourth aspect of the present invention there is provided a coupling made by a method according to the above further aspect of the present invention.

A coupling, an assembly of the coupling on a conduit and a method of forming the coupling according to the present invention, will now be described, by way of example, with reference to the accompanying drawings.

Brief Description of the Drawings

Figure 1 is a side elevation view of the assembly of coupling and conduit;

Figure 2 is a sectional side elevation view of the coupling; and

Figure 3 is a perspective, cut-away view showing the inside of the coupling.

Detailed Description of the Preferred Embodiment

The assembly comprises a conduit 1 and a coupling 2 fitted on the forward, left-hand end 10 of the conduit.

The conduit 1 is entirely conventional and is of a rigid but bendable plastics material with a circular section and has corrugations 11 on its external and internal surfaces. The left-hand end 10 of the conduit 1 is cut square.

The coupling 2 comprises two parts joined with one another, namely a body or housing 20 and a layer 21. The housing 20 is similar to previous housings, being a single-piece moulding of a rigid plastics material of substantially tubular shape. The housing 20 has a bore 22 extending axially along its length and divided by a shoulder 23 into two portions, namely an entrance portion 24 and an exit portion 25. The rear entrance portion 24 at the

right-hand end of the housing 20 receives the end of the conduit 1 and a tapers slightly along its length. The forward, exit portion 25 has a reduced constant diameter. Towards its right-hand end, the housing 20 is formed with retaining means in the form of two retaining or locking arms or catches 27 and 28 each having an inwardly-extending tooth 29 at its free, left-hand end extending across the central region of the arms. The coupling could have any number of one or more locking arms. The right-hand end of each arm 27 and 28 is attached integrally with the housing 20 by a hinge portion 30 of reduced thickness, which enables the arms to be flexed resiliently outwardly. Each arm 27 and 28 has two opposite side regions 31, which are formed with a shallow ramp 32 of triangular section just rearwardly of the teeth 29. The purpose of the ramps 32 is to aid removal of the coupling from its mould tool in the manner described in GB 2225550. The side regions 31 project to the left forwardly beyond the teeth 29 a short distance to form stops 131. The purpose of these stops 131 is to engage the outside of the conduit 1 when the arms 27 and 28 are deflected inwardly as a result of a high force applied to pull the conduit out of the coupling 2. The stops 131 limit how far the arms 27 and 28 can be pulled in and, therefore, reduce the risk of damage to the arms. The natural position of the locking arms 27 and 28 is with their teeth 29 projecting slightly into the bore 22, as shown in Figures 2 and 3.

The forward, left-hand end of the housing 20 has an external screw thread 33 by which the coupling 2 can be screwed into a cooperating female coupling (not shown). Instead of a screw thread, the housing could have other forms of fixing formation, such as barbs or spring catches. Externally, the housing 20 has a forwardly-facing face or ledge 40 at the location of the inner shoulder 23.

The layer 21 is of a deformable, resilient thermoplastics material, preferably an elastomer. The layer 21 covers the entire tapered inner surface of the entrance portion 24, the right-hand end face 41 of the housing 20 and other parts of the outer surface of the housing.

That part of the layer 21 on the inside of the housing 20 provides an elastomeric seal 42 with the outside of the conduit 1. The dimensions of the housing 20, angle of taper and thickness of the layer 21 are such that the effective diameter of the bore 22 at the right-hand end is slightly greater than the external diameter of the conduit 1 and, at its left-hand end, is slightly smaller than the external diameter of the conduit. This arrangement is such that the end 10 of the conduit 1 can be pushed into the entrance portion 24 of the bore 22 but is prevented by contact with the tapering surface from contacting the shoulder 23. In this way, the seal 42 is compressed slightly into a tight sealing contact with the outside of the conduit 1 at its forward end 10.

An outer region 43 on one side of the housing 20 towards its left-hand end is covered by the layer 21 and is of a generally tulip shape. There is a corresponding region on the opposite side of the housing. These parts of the layer 21 provide manual gripping regions 43 to enable the coupling 2 to be held more securely by the hand. The layer 21 also provides an annular flange 44 on the external ledge 40, which has two concentric sealing ribs 144. The flange 44 and tulip-shape area 43 are continuous with one another via a stem portion 45. The flange 44 provides a washer or seal with the end of a cooperating coupling (not shown) screwed onto the threaded portion 33. Alternatively, the flange 44 may seal against the face of a panel around an opening through which the coupling extends. This flange portion 44 can be omitted or provided by a separate component.

Preferably, the layer 21 is formed using a two-shot injection moulding process so that the seal is formed by the same machine that moulds the housing 20. The housing 20 is moulded on one core pin, which is then removed and a smaller diameter core pin is used to mould the internal elastomeric layer, between the outside of the second core pin and the inside of the housing. The elastomeric material can be injected into the mould from the right-hand end of the housing so that it flows over both the inner surface and over the outer regions 43 and 45 into the flange portion 44, as one continuous layer. It will be appreciated, however, that material to form the inner and outer layers could be injected separately. Because the seal part 42 is moulded into the housing 20, it is securely bonded with it and forms an effective seal with the inside of the housing.

In use, the coupling 2 is provided as a single component. The user simply pushes the forward end 10 of the conduit 1 into the rear end of the housing 20, so that the teeth 29 on the locking arms 27 and 28 ride over corrugations 11 on the conduit. The forward end 10 of the conduit 1 deforms the seal 42 outwardly slightly as it is pushed into the entrance portion 24. Rearward movement of the conduit 1 is prevented by the locking arms 27 and 28, which engage the conduit more tightly as force is applied to separate the conduit and coupling. The conduit 1 holds the material of the seal part 42 compressed between the outside of the conduit and the inside of the housing 20 to provide an effective seal.

This arrangement enables both an effective seal and external gripping regions to be provided without the need for separate components or separate assembly operations.

It will be appreciated that the invention is not limited to use with conduits but could be used on other forms of pipe. Alternative locking means could be used, such as with uncorrugated pipes. The retaining means could be provided by a separate component